



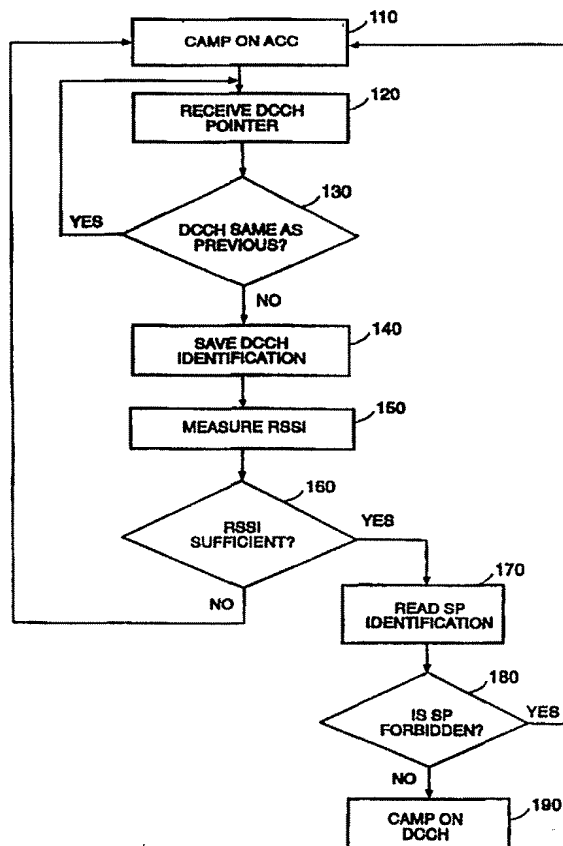
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(21) International Application Number: PCT/US98/21826 (22) International Filing Date: 15 October 1998 (15.10.98) (30) Priority Data: 08/960,383 29 October 1997 (29.10.97) US (71) Applicant: ERICSSON, INC. [US/US]; P.O. Box 13969, Research Triangle Park, NC 27709-3969 (US). (72) Inventors: SHAH, Amish; 137 Sterlingdaire Drive, Cary, NC 27511 (US). FINDIKLI, Nadi, S.; 1821 Grande Harmony Place, Cary, NC 27513 (US). HOOVER, David, J.; 113 Dorchester Pines Court, Cary, NC 27511 (US). (74) Agents: OWEN, John, R. et al.; Rhodes, Coats & Bennett, LLP, P.O. Box 5, Raleigh, NC 27602 (US).			(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>

(54) Title: METHOD FOR RESPONDING TO DCCH POINTERS

(57) Abstract

A method for responding to a pointer received on an analog control channel pointing to a control channel belonging to a forbidden service provider includes avoiding a power-up scan and resuming camping on the analog control channel. A wireless communications mobile unit is camped on an analog control channel and may receive a channel pointer to a digital control channel. If the digital control channel has acceptable received signal strength, the service provider information for that control channel is checked. If the control channel belongs to a non-forbidden service provider, the mobile unit camps on the digital control channel. If the control channel belongs to a forbidden service provider, the mobile unit returns to camping on the analog control channel without performing an intervening power-up scan. By avoiding power-up scans when the pointed-to channel belongs to a forbidden service provider, less power is consumed and users receive more consistent communications service.



METHOD FOR RESPONDING TO DCCH POINTERS

Field of Invention

The present invention relates generally to the communications field and, in particular, to a method for reducing the amount of time and resources required to respond to digital control channel pointers received on an analog control channel in a wireless communications system.

Background of the Invention

Analog wireless communications systems have been long established in the United States and elsewhere. For example, the advanced mobile phone service (AMPS) cellular telephone system was developed in the early 1970s and is still in widespread use in the United States today. The AMPS system uses Frequency Division Multiple Access (FDMA) to provide shared access to the available communications spectrum. With FDMA, users are assigned to a channel from a limited set of communications channels in the available communications spectrum. In typical AMPS systems, 25 kHz communications channels are used whose carriers are separated by 30 kHz. The number of available channels is limited by the size of the available communications spectrum. When a user places a call, the user is assigned to one of the available channels. If no channel is available, the user's call is blocked. Unfortunately, the increasing demand for cellular services has resulted in a corresponding increase in the frequency of call blocking, particularly in congested urban areas.

Recent advances in digital communications allow for an increase in network capacity without requiring allocation of additional communications spectrum. In addition to FDMA, digital wireless communication systems use time division multiple access (TDMA) or code division multiple access (CDMA) to allow multiple

systems are operated according to the protocol described in Telecommunications Industry Association Interim Standard IS-136. Within IS-136 and similar systems, digital communications are more desirable, but both analog and digital modes are supported.

Analog, digital, and dual-mode wireless communications systems typically employ a large number of discrete communication channels for communicating voice and data from one location to another and for controlling system functions. Further, it is also common for there to be multiple communications service providers in competition with each other for each type of communication service. As such, within a given geographical area it is typical for the various communication channels to be allocated to the different competitors such that only one service provider is responsible for providing service on any given channel.

To facilitate communications channel allocation, the spectrum of channels may be divided into several channel bands, each containing a plurality of communications channels. Thereafter, an entire channel band may be allocated to a particular service provider for a given geographic region. Thus, in a certain region, service provider Alpha may be allocated channel bands A and C, while service provider Beta may be allocated channel band B, and service provider Gamma all other channel bands. The particular details of the channel band allocations are well known in the industry.

The various service providers are typically in competition with each other. However, many service providers have bi-lateral agreements under which subscribers (users) to one service provider may use the communications network of another service provider. Despite the prevalence of such agreements, some service providers have no such agreements with particular other service providers

power-up scan utilizes substantial system resources including mobile unit power, it is desirable to avoid useless power-up scans.

Therefore, it is desirable for mobile phone to avoid power-up scans when a digital control channel pointer is received on an analog control channel that points to a control channel belonging to a service provider that the mobile phone is forbidden to use.

Summary of the Invention

The present invention provides a method for avoiding power-up scans when the pointed-to control channel belongs to a service provider that the wireless communications mobile unit is forbidden to use. The wireless communications mobile unit receives a list of forbidden service providers and camps on an analog control channel. Thereafter, the mobile unit receives a channel pointer to a digital control channel. If the digital control channel has acceptable received signal strength, the service provider information for that control channel is checked. If the control channel belongs to a non-forbidden service provider, the mobile unit camps on the digital control channel. If the control channel belongs to a forbidden service provider, the mobile unit returns to camping on the analog control channel without performing an intervening power-up scan. To increase efficiency, the mobile unit optionally keeps track of the last pointed-to channel and disregards subsequent pointers to that channel. By avoiding power-up scans when the pointed-to channel belongs to a forbidden service provider, less power is consumed and users receive more consistent communications service.

establishing a new communications session, and transferring oversight of a communications session from one base station 14 to another.

The available communications spectrum 50 for wireless communications is divided into a plurality of "channel bands" 30 each of which comprises a plurality of communications channels 20. The channel bands 30 are allocated as a unit to the various competing communications service providers. In a particular geographic area, only one service provider will provide service within any given channel band 30. However, other service providers may provide service in a different channel band 30. Thus, at any given location, a mobile unit 12 is likely to be within the service area of a plurality of different service providers all of which operate in different channel bands 30. Because some service providers will offer digital services while others offer analog services, the mobile unit 12 may have a choice between the two types of services.

For a particular mobile unit 12, the various service providers may be classified as either a Home SP, a Partner SP, a Favored SP, a Neutral SP, or a Forbidden SP. When acquiring service on a control channel 20, the mobile unit 12 will scan the available control channels and make a selection based on the service provider classification. Home SPs and Partner SPs are preferred over all others and are known as acceptable service providers. A Favored SP has a lower priority than an acceptable SP, but a higher priority than a Neutral SP. The lowest classification is Forbidden SP. The mobile unit 12 will not register with a Forbidden SP except in emergencies, such as when "911" is dialed. As used herein, the term "Forbidden SP" refers to a service provider that should be used for communications only in emergencies. The mobile unit 12 should acquire service on a control channel 20 with the highest classification level.

hyperband) and a channel number. It is common for dual-mode wireless communications systems 10 to transmit DCCH pointers periodically on the ACC in order to promote digital operation. In IS-136 systems, the typical interval between DCCH pointers is one to five seconds.

A problem occurs when the service provider for the ACC is not the same service provider for the DCCH. For instance, a given mobile unit 12, subscribing to service from a given service provider, may consider the service provider for the ACC as "acceptable," but consider the service provider for the DCCH as "forbidden." To illustrate this, assume that a dual-mode mobile unit 12 is subscribed to service provider Alpha. Service provider Alpha provides both analog and digital service. Alpha has a bilateral sharing agreement with service provider Beta, an analog only provider, that allows all of Alpha's subscribers to use Beta for analog service, and vice-versa. Another service provider, Gamma, is a digital only provider. Gamma has a bilateral sharing agreement with Beta, but no agreement with Alpha. With respect to Alpha mobile units 12, Gamma is a Forbidden SP. The Alpha mobile unit 12 is in a cell which has no service from Alpha, but has analog service by Beta and digital service from Gamma. The system logic of the cell is to provide DCCH pointers on the Beta analog control channels that point to a Gamma digital control channel. The Alpha mobile unit 12 is camped on the Beta analog control channel and receives the DCCH pointer the Gamma DCCH. Because the Alpha mobile unit 12 is forbidden to use service provider Gamma (except in emergency situations), the DCCH pointer creates a problem.

Under the prior art, the mobile unit 12 would respond to this problem by initiating a power-up scan in response to a DCCH pointer directing the mobile unit 12 to a control channel 20 belonging to a Forbidden SP. The prior art method is

be checked for RSSI and service provider information. Accordingly, a power-up scan consumes substantial mobile unit 12 resources.

If the mobile unit 12 was camped on an analog control channel 20, it is probable that the mobile unit 12 found no suitable DCCH during the last power-up scan. As such, it is possible that the mobile unit 12 will conclude the prior art process by camping on the same analog control channel after the power-up scan (box 110). Alternatively, the mobile unit 12 may conclude the prior art process by camping on a different analog control channel after the power-up scan. Note that if the mobile unit 12 camped on the same analog control channel, the mobile unit 12 will likely again receive the same DCCH pointer, which would be disregarded after comparison with the stored DCCH pointer (see boxes 130-140).

Because receiving a DCCH pointer to a DCCH belonging to a Forbidden SP would result in a power-up scan, but the power-up scan would likely return the mobile unit 12 to the previous analog control channel, the triggered power-up scan would not result in better service for the mobile unit 12. Instead, the mobile unit 12 would expend resources, e.g. time and power, running a power-up scan that merely identified the analog control channel that the mobile unit 12 was previously camped on.

The method of the present invention avoids a power-up scan when the service provider is identified as a Forbidden SP; the mobile unit 12 instead returns directly to camping on the known analog control channel 20. See Figure 4. Once camped on an ACC (box 110), the mobile unit 12 of the present invention looks for a DCCH pointer. When one is received (box 120), the pointed-to channel identification is compared against the identification of the previous DCCH, if there is any (box 130). If the identifications match (box 130), the DCCH pointer is

The storing of the channel identification described above (box 140) may include storing the communications spectrum 50, channel number, and other channel information.

The discussion above has principally used a cellular mobile telephone as the example of a mobile unit 12. However, it is to be understood that the present invention encompasses any type of mobile unit 12, e.g., a cellular mobile telephone, a pager, a personal communications device, or any other device that uses a wireless communication system 10 having a plurality of service providers, at least one of which is forbidden, and which uses channel pointers.

The present invention may, of course, be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

4. The method of claim 3 further including:
 - a) receiving a second digital control channel pointer designating a second pointed-to digital control channel; said second pointer including channel identification for said second pointed-to control channel;
 - b) comparing said channel identification for said second pointed-to control channel with said stored channel identification; and
 - c) disregarding said second pointer if said channel identification for said second pointed-to control channel matches said stored channel identification.
5. The method of claim 1 further including receiving a list of forbidden service provider identification information.
6. The method of claim 5 wherein said service provider information includes SID codes.
7. The method of claim 5 wherein said service provider information includes SOC codes.
8. The method of claim 1 wherein said mobile unit is IS-136 compatible.
9. The method of claim 1 further including camping on said first pointed-to control channel if said service provider information indicates that said service provider is not from a forbidden class.
10. The method of claim 1 wherein said reading of service provider information includes decoding a F-BCCH message.
11. The method of claim 2 wherein said checking the received signal strength includes:

information indicates that said service provider is from a forbidden class.

13. The method claim 12 further including:

- a) thereafter receiving a second digital control channel pointer designating a second pointed-to digital control channel; said second pointer including channel identification for said second pointed-to control channel;
- b) comparing said channel identification for said second pointed-to control channel with said stored channel identification; and
- c) disregarding said second pointer if said channel identification for said second pointed-to control channel matches said stored channel identification.

14. The method of claim 12 further including receiving a list of forbidden service provider identification information.

15. The method of claim 13 wherein said service provider information includes SID codes.

16. The method of claim 13 wherein said service provider information includes SOC codes.

17. The method of claim 12 further including camping on said first pointed-to control channel if said service provider information indicates that said service provider is not from a forbidden class.

18. The method of claim 12 wherein said reading of service provider information includes decoding a F-BCCH message.

19. The method of claim 12 wherein said checking the received signal strength includes:

returning to said camping on said analog control channel if said analog operating mode signal strength is not acceptable;

- g) reading service provider information from said first pointed-to control channel indicating the service provider for said first pointed-to control channel if said received signal strength in digital operating mode is acceptable; and
- h) thereafter re-camping on said analog control channel without performing an intervening power-up scan if said service provider information indicates that said service provider is from a forbidden class or camping on said first pointed-to control channel if said service provider information indicates that said service provider is not from a forbidden class.

21. The method of claim 20 further including:

- a) thereafter receiving a second digital control channel pointer designating a second pointed-to digital control channel; said second pointer including channel identification for said second pointed-to control channel;
- b) comparing said channel identification for said second pointed-to control channel with said stored channel identification; and
- c) disregarding said second pointer if said channel identification for said second pointed-to control channel matches said stored channel identification.

22. The method of claim 20 wherein said service provider information includes SID codes.

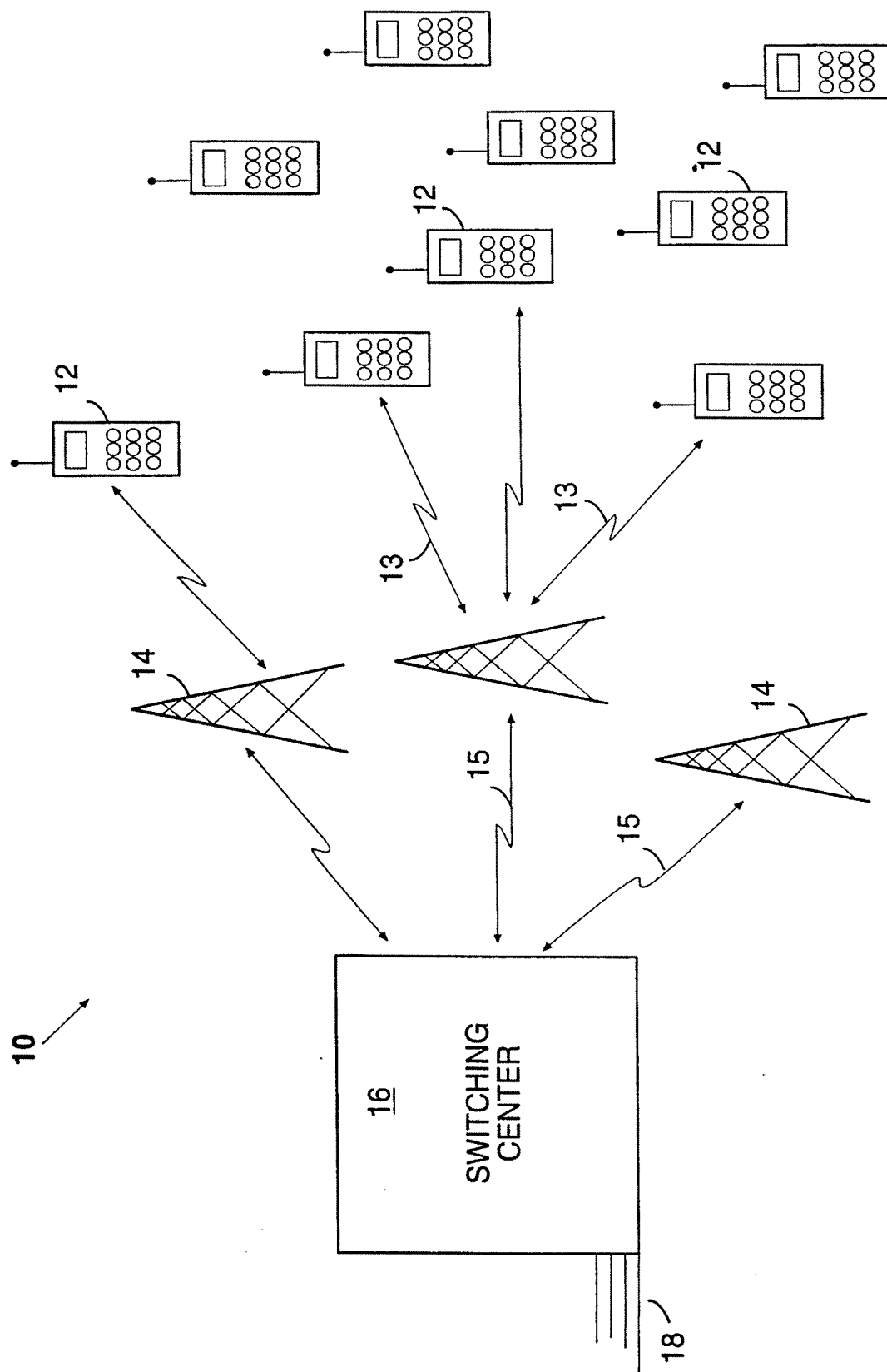
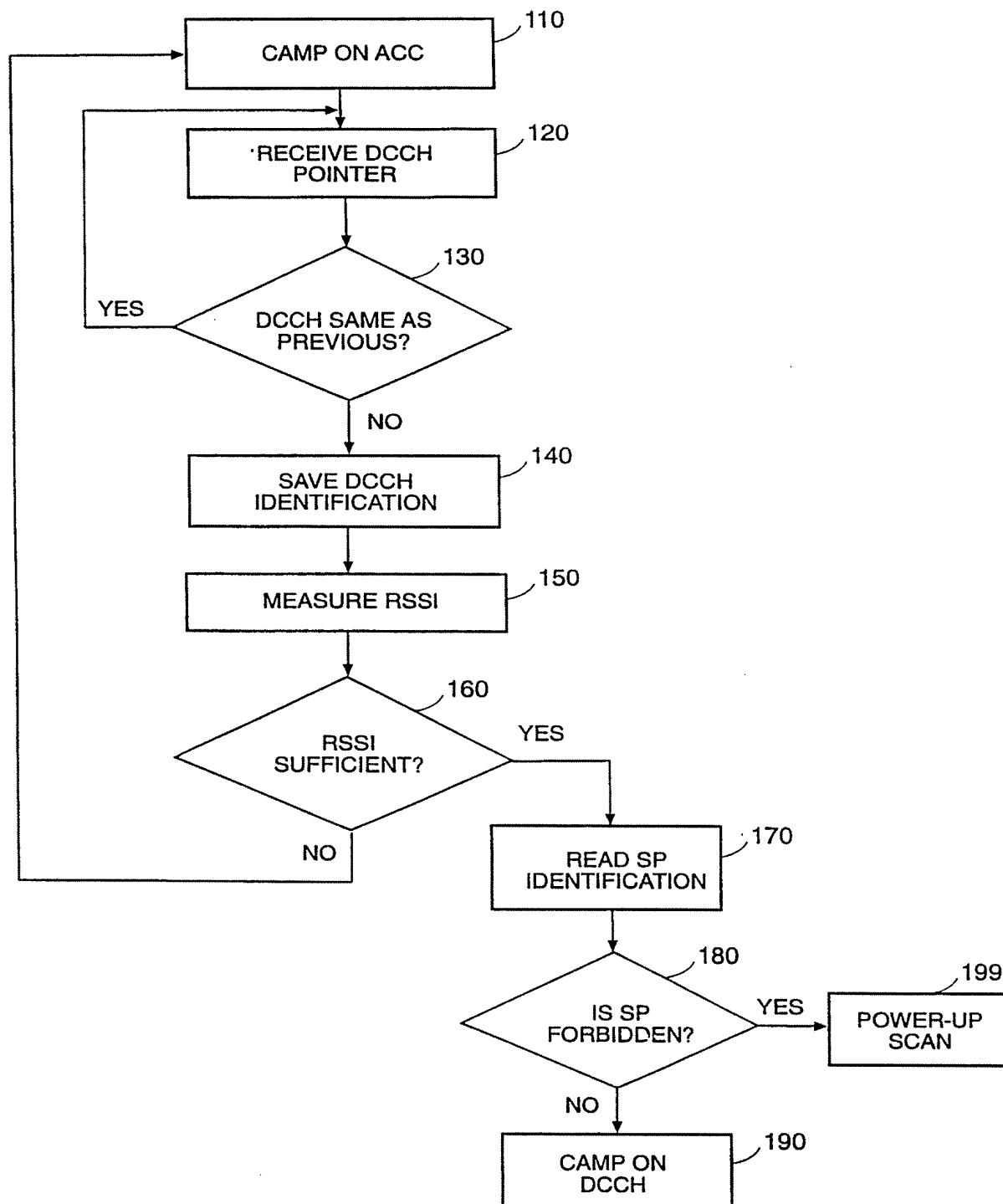


FIG. 1



(Prior Art)

FIG. 3

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/21826

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H0407/32 H0407/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 97 34438 A (ERICSSON GE MOBILE INC) 18 September 1997 see page 10, line 29 - page 12, line 20 see page 16, line 14 - page 17, line 27 see page 20, line 31 - page 21, line 20 ---	1, 12, 20
A	US 5 420 911 A (DAHLIN JAN E A S ET AL) 30 May 1995 see column 2, line 31 - line 48 see column 11, line 12 - column 13, line 14 ---	1, 12, 20
A	EP 0 779 751 A (AT & T WIRELESS SERVICES INC) 18 June 1997 see column 5, line 46 - column 8, line 48 see column 11, line 41 - column 12, line 56 -----	1, 12, 20



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

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"E" earlier document but published on or after the international filing date

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"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

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